High Rate Discharge Tester HEW
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1. The Concept

The High Rate Discharge Tester HEW is particularly designed for testing the cranking performance (cold and warm cranking) of automotive batteries. The HEW performs discharge tests with selectable current values in accordance with all national and international test standards. It may also be used for long-time discharge tests if the current value is reduced to 60 % of the respective nominal value.

Many of the standardized test programs use the discharge current as nominal value. But power or resistance values may be used as well. A discharge test may be terminated not only after a specified time, but also when a certain final voltage or an Ah (or Wh) value is reached. For registration of the measured values, intervals of time, voltage, ampere-hours, or energy (watt-hours) are suitable parameters.

2. Design and Function

In the standard version, the unit is composed of a 19" cabinet with built-in power circuit. The power circuit is provided with transistors and contains no mechanical contactors.

The unit is fitted on the rear side with two copper rails for connection of high rate current cables. The mains supply is ensured by single-phase AC.

The programmable control unit PCU is the core of the HEW. The PCU is a standalone microcomputer system for a universal data logging and precise control of analogue measured values. It also assumes the processing of stored test programs. Two interfaces allow to connect a video terminal or a host computer.

The actual status, i.e. active, discharge, halt, or error, is indicated by LEDs on the front plate. In the manual operating mode, it is possible to select one of the stored programs No. 1 to 9 at a thumbwheel and to start, interrupt and terminate the program by pressing the respective button. Digital instruments for battery voltage and current are fitted on the left side.

3. Operation of the HEW

3.1 Terminal Operation

The practical operation, i.e.
- writing of the programs and their transfer to the PCU
- starting and terminating or interrupting of the programs
- display and printing of the measured data,

in a small laboratory is made via terminal, keyboard and printer. The data transfer is made via a partyline chaining the HEW with other test circuits and connecting them to the terminal. Therefore the latter might be installed separate from the test equipment, in the office of the laboratory manager.
3.2 Computer Operation

In larger laboratories, the survey over the running tests at the terminal becomes quite difficult. In this case, the operation via a host computer (PC) is the state of the art.

The main functions (as described in 3.1) are extended to:
- survey on the actual status of all circuits
- graphic evaluation of the test results
- program library with up to 1000
test programs
and some other features. The user is guided by a comfortable menu.

3.3 Test with Quick Menu

Load current and final voltage values may be entered directly at the terminal. The test will start immediately after entry of the values. The discharge time and the voltage value after 30 seconds are displayed on the screen. Also displayed are capacity, energy, and temperature (option).

4. The Programs

All tests programs can be split into steps, where certain operations must be executed under well defined conditions. Each step is fixed in a program line.

Each program step is divided into columns and each column has a headline describing its function.

Column 1: Operator

Each program step starts with an operator determining the function of the HEW. The operator names are simple abbreviations of the respective functions.

Examples:

DCH = discharge
PAU = pause
BEG/CYC = this program part is repeated in cycles

Column 2: Nominal Value

As nominal values may be entered current, resistance or power values.

Column 3: Termination

The termination values current, voltage, time, capacity, energy and temperature determine the end of a program step and thus the beginning of the next program step.

Column 4: Abort

The values entered under this column may be the same as for the termination values. However, in this case, the program run will be interrupted if one of these limit values is reached.

Column 5: Registration

The conditions for the registration are entered into the last column. These may be time intervals or changes in current, voltage, capacity, energy, or temperature.

Program Example
5. Types and Technical Data

5.1 Standard Series for 12 Volt Batteries

For the most frequent applications, four standard types are available. They are designed for 600, 1000, 1500, or 2000 A:

- HEW 600-12
- HEW 1000-12
- HEW 1500-12
- HEW 2000-12

5.2 Standard Series for 12 Volt – 36 Volt Batteries

HEW 2000/12 – 700/36

Other current and voltage ranges on request.

5.3 Options:

- **Start-Stop Operation with 42 Volt Batteries**

  With the introduction of 42 Volt vehicle systems and starter generators (e.g. crankshaft starter generator) there is a need for test equipment capable of simulating these highly variable load conditions on the battery system. By integrating a charging unit into the HEW 2000/12-700/36 along with an electronic changeover switch, the rapid load alterations between starting (discharges) and recuperative braking (charges) can be simulated. In this version the discharge current will be limited to a maximum of 1000 A.

- **Central Changeover 12 V-24 V**

  (only for standard series 12 V)

  If 12 V and 24 V batteries are to be tested alternatively, a changeover switch is required. As the maximum power of the tester remains constant, the available discharge current is reduced to half. In the 24 V mode operation, a HEW 1500-12 will discharge the battery with maximum 750 A.

- **Single Cell Operation**

  The option offers the possibility to discharge 1 to 6 cells. The tester will be provided with an additional buffer voltage unit.

- **Temperature Measurement**

  The battery temperature may be recorded as an additional parameter. The temperature can then be used as a termination value or as an abort value. This is a very useful option if the following step shall start under exactly defined conditions or if you want to test the load limits of a battery.

- **Additional Voltage Measurements (Data Logger)**

  In many tests, e.g. capacity tests, the voltages measured with additional sensors (half cell potentials) are of great interest. This requires additional measuring channels, which must be scanned accordingly. The HEW must be fitted with a data port and the relevant software. Since 5/91 it is production standard that the HEW units are prepared for a retrofitting. Modification of older models is possible.

  Data loggers are available for serial and parallel measurement. The serial measurement is less expensive, though slower, the measured data are multiplexed and transferred to a common A/D converter. The parallel measuring data logger is provided with one A/D converter for each input channel. The loggers are installed in separate casings and may be connected alternatively to each circuit if fitted with a data port.
6. Technical Data Standard Series 12 V

6.1 Power Unit and Control Panel

Max. discharge current: 600 A/1000 A/1500 A/2000 A

Number of batteries: one 6 V or 12 V battery
option: single cells

Voltage range: 4.5 V - 14 V (with nominal current)

Current accuracy:
Range 10% - 100% I_{NOM} ± 0.5% of set value
Range < 10% I_{NOM} ± 0.05% of final value

Power circuits: transistors

Control elements: main switch, program selector
switch, terminal connection,
start, hold and stop buttons

Displays: LEDs for power, active,
discharge, pause and error,
digital instruments for current and
voltage with additional test sockets

Controlled variables: current, voltage, power and resistance

Termination values: discharge time, final voltage,
discharge current,
Ah discharged, Wh discharged

Programmable functions: discharge, pause, cycles

Program length: max. 50 steps (if operated with BTS-500)

Program memory: max. 20 programs (if operated with BTS-500)

Display of measuring values: during operation permanently on the monitor

Displayed and printed measuring values for
each program step: voltage, current, time,
balance of Ah meter,
balance of Wh meter, function

6.2 General Data

Power requirements: 230 V / 50 Hz / max. 3.0 A
other voltages, frequency on request

Ambient temperature: 10 to 40 °C
7. Technical Data HEW 2000/12 – 700/36

7.1 Power Unit and Control Panel

Max. discharge current: 700 A at 36 V
1000 A at 24 V
2000 A at 12 V

Voltage range: 6 V - 42 V (at max. 700 A)

Current accuracy:
Range 10% - 100% \(I_{\text{NOM}}\) ± 0,5% of set value
Range < 10% \(I_{\text{NOM}}\) ± 0,05% of final value

Power circuits: transistors

Control elements: main switch, program selector switch, terminal connection, start, hold and stop buttons

Displays: LEDs for power, active, discharge, pause and error, digital instruments for current and voltage with additional test sockets

Controlled variables: current, voltage, power and resistance

Termination values: discharge time, final voltage, discharge current, Ah discharged, Wh discharged

Programmable functions: discharge, pause, cycles

Program length: max. 50 steps (if operated with BTS-500)

Program memory: max. 20 programs (if operated with BTS-500)

Display of measuring values: during operation permanently on the monitor

Displayed and printed measuring values for each program step:
voltage, current, time, balance of Ah meter, balance of Wh meter, function

7.2 General Data

Power requirements: 230 V / 50 Hz / max. 3.0 A
other voltages, frequency on request

Ambient temperature: 10 to 40 °C
8. Weight, Dimensions and Power Consumption

<table>
<thead>
<tr>
<th>Model</th>
<th>Weight</th>
<th>Height</th>
<th>Width</th>
<th>Depth</th>
<th>Power Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard Series for 6 V and 12 V Batteries</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEW 600 -12</td>
<td>150 kg</td>
<td>1950</td>
<td>670</td>
<td>825 mm</td>
<td></td>
</tr>
<tr>
<td>HEW 1000 -12</td>
<td>170 kg</td>
<td>1950</td>
<td>670</td>
<td>825 mm</td>
<td></td>
</tr>
<tr>
<td>HEW 1500 -12</td>
<td>200 kg</td>
<td>1950</td>
<td>670</td>
<td>825 mm</td>
<td></td>
</tr>
<tr>
<td>HEW 2000 -12</td>
<td>235 kg</td>
<td>1950</td>
<td>670</td>
<td>825 mm</td>
<td></td>
</tr>
<tr>
<td><strong>Standard Series for 12 V – 36 V Batteries</strong></td>
<td></td>
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</tr>
<tr>
<td>HEW 2000/12 – 700/36</td>
<td>250 kg</td>
<td>1950</td>
<td>670</td>
<td>825 mm</td>
<td></td>
</tr>
<tr>
<td><strong>with single cell operation</strong></td>
<td></td>
<td></td>
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<tr>
<td>HEW 600 -12</td>
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<td>825 mm</td>
<td>5500 VA</td>
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<tr>
<td>HEW 1000 -12</td>
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<td>670</td>
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<td>670</td>
<td>1500 mm</td>
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<tr>
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<td>1950</td>
<td>670</td>
<td>1500 mm</td>
<td>18000 VA</td>
</tr>
</tbody>
</table>

On request, the units can also be designed for any other current and voltage values.